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Apparatus and related method for displaying probability of success communication in mobile radio terminal

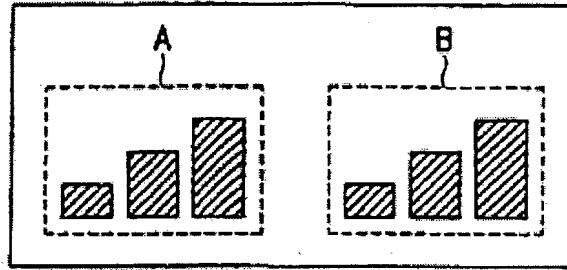
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Abstract of correspondent: **GB2343334**

Terminal and method to display the probability of attaining successful communication in a mobile radio terminal, preferably a mobile radio telephone. The terminal has interference level detector means to detect a data error rate of a received signal and display means to display information concerning the detected data error rate, e.g. received signal interference level B. Preferably, the display means may simultaneously display information concerning other detected parameters affecting a probability of attaining successful communication, such as a received signal strength indicator (RSSI) A. Thus the display is able to provide a clear indication of the probability of successful communication method and the individual factors involved. The information may show low, medium or high probability of success (figs 1-3) and be displayed using a variable indicator such as a digit, icon, graph or bar or similar means.

**FIG. 5**Data supplied from the **esp@cenet** database - Worldwide

Apparatus and related method for displaying probability of success communication in mobile radio terminal

Claims of correspondent: GB2343334

CLAIMS:1. A mobile radio terminal comprising: -an interference level detector for detecting a data error rate of a received signal; and-a display arranged to display information concerning said data error rate.

2. A mobile radio terminal according to claim1, further comprising means for generating a received signal interference level in accordance with the data error rate, wherein the display is arranged to display information representing the received signal interference level.

3. A mobile radio terminal according to any preceding claim, further comprising a detector for detecting a level of a parameter, other than the data error rate, affecting a probability of attaining successful communication in a mobile radio telephone; and wherein the display is further arranged to display information concerning said parameter.

4. A mobile radio terminal according to claim 3 wherein the parameter is a received signal strength indicator (RSSI) of the received signal.

5. A mobile radio terminal according to any preceding claim wherein the information comprises an indication of low, medium or high probability of attaining successful communication.

6. A mobile radio terminal according to any of claims 1-4 wherein the information comprises an indication of probability of attaining successful communication, using a variable indicator such as a digit, or an icon, or a graph or similar means.

7. A mobile radio terminal according to any of claims 3-6 wherein the information concerning the data error rate and the information concerning the parameter are simultaneously displayed.

8. A mobile radio terminal according to any preceding claim, further comprising a microprocessor for receiving the data error rate and/or the parameter, and for supplying the information concerning the data error rate and/or the information concerning the parameter to the display.

9. A method for displaying a probability of attaining successful communication in a mobile radiophone, comprising the steps of: -detecting a data error rate of a received signal; and -displaying information concerning said data error rate.

10. A method according to claim 9 further comprising: -generating a received signal interference level in accordance with the data error rate; and -displaying information representing the received signal interference level.

11. A method according to claim 9 or claim 10, further comprising:-detecting a level of a parameter, other than the data error rate, affecting a probability of attaining successful communication in a mobile radio telephone; and -displaying information concerning said parameter.

12. A method according to claim 11 wherein the parameter is a received signal strength indicator (RSSI) of the received signal.

13. A method according to any of claims 9-12 wherein the information comprises an indication of low, medium or high probability of attaining successful communication.

14. A method according to any of claims 9-12 wherein the information comprises an indication of probability of attaining successful communication, using a variable indicator such as a digit, or an icon, or a graph or similar means.

15. A method according to any of claims 11-14 wherein the information concerning the data error rate and the information concerning the parameter are simultaneously displayed.

16. A method according to any of claims 9-15 wherein a microprocessor performs the steps of:-receiving the data error rate and/or the parameter; and -supplying the information concerning the data error rate and/or the information concerning the parameter to the display.

17. A mobile radio terminal substantially

as described with reference to and/or as illustrated in Figs. 4-6 of the accompanying drawings.

18. A method substantially as described with reference to and/or as illustrated in Figs. 4-6 of the accompanying drawings.

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Apparatus and related method for displaying probability of success communication in mobile radio terminal

Description of correspondent: GB2343334

TERMINAL AND METHOD FOR DISPLAYING THE PROBABILITY OF ATTAINING SUCCESSFUL COMMUNICATION IN A MOBILE RADIO

TELEPHONE

Background of the Invention

The present invention relates to a mobile radio terminal, and more particularly to a device for displaying the probability of attaining successful communication in a mobile radio terminal such as CDMA (Code Division Multiple Access) mobile radio telephone.

Conventionally, a mobile radio terminal displays a probability of attaining successful communication by continuously detecting the Received Signal Strength

Indicator (RSSI) of a signal received from the base station. For example, such probability may be represented by three graphic bars which may be displayed on the LCD of the mobile radio terminal, as shown in Figs. 1 to 3.

If the detected RSSI is strong, indicating the highest probability of successful communication, all three bars which are respectively small, medium and large are displayed as shown in Fig. 3. Likewise, if the detected

RSSI is medium or weak, respectively indicating relatively less or the least probability, the small and medium bars are displayed as shown in Fig. 2, or only the small bar as shown in Fig. 1.

However, the probability of attaining successful communication does not simply depend on the RSSI.: there is wave interference from adjacent channels or base stations, the probability is decreased even with the strong RSSI. For this reason, there has been proposed to take into consideration the data error rate of the received signal when displaying the probability. For example, if the detected RSSI is strong with a high error rate, the probability is displayed low. However, this does not correctly inform the user of the causes contributing to the probability of attaining successful communication.

Summary of the Invention

It is an object of the present invention to provide a device and method for displaying the probability of attaining successful communication of a mobile radio terminal. Preferably such a device and method correctly informs the user of the causes influencing the probability.

According to an aspect of the present invention, a mobile radio terminal comprises: an interference level detector for detecting a data error rate of a received signal; and a display arranged to display information concerning said data error rate.

The mobile radio terminal may further comprise means for generating a received signal interference level in accordance with the data error rate. The display may be arranged to display information representing the received signal interference level.

The mobile radio terminal may further comprise a detector, for detecting a level of a parameter affecting a probability of attaining successful communication in a mobile radio telephone (other than the data error rate).

The display may be further arranged to display information concerning said parameter.

The parameter may be a received signal strength indicator (RSSI) of the received signal.

The mobile radio terminal may further comprise a microprocessor for receiving the data error rate and/or the parameter, and for supplying the information concerning the data error rate and/or the information concerning the parameter to the display.

The present invention also provides a method for displaying a probability of attaining successful communication in a mobile radiophone, comprising the steps of: detecting a data error rate of a received signal; and displaying information concerning said data error rate.

The method may further comprise: generating a received signal interference level in accordance with the data error rate; and displaying information representing the received signal interference level.

The method may further comprise: detecting a level of a parameter affecting a probability of attaining successful communication in a mobile radio telephone (other than the data error rate); and displaying information concerning said parameter.

The parameter may be a received signal strength indicator (RSSI) of the received signal.

A microprocessor may perform the steps of: receiving the data error rate and/or the parameter; and supplying the information concerning the data error rate and/or the information concerning the parameter to the display.

The information may comprise an indication of low, medium or high probability of attaining successful communication.

The information may comprise an indication of probability of attaining successful communication, using a variable indicator such as a digit, or an icon, or a graph or similar means.

Information concerning the data error rate and information concerning the parameter may be simultaneously displayed.

Brief Description of the Drawings

The objects, characteristics and scope of the present invention will be more fully understood with reference to the following description of certain embodiments, given by way of examples only, with reference to the accompanying drawings, in which:

Figs. 1 to 3 are schematic diagrams illustrating graphic bars displayed on the LCD of a conventional mobile radio terminal, which represent the probabilities of attaining successful communication according to prior art; -

Fig. 4 is a block diagram illustrating the structure of a mobile radio telephone according to an aspect of the present invention;

Fig. 5 is a schematic diagram for illustrating graphic bars displayed on the LCD of a mobile radio telephone according to an aspect of the present invention; and

Fig. 6 is a flow chart for illustrating a process of displaying the probability of attaining successful communication of a mobile radio telephone according to an aspect of the present invention.

Detailed Description of the Drawings

A mobile radio telephone according to an embodiment of the present invention preferably incorporates a device which enables the user to correctly perceive causes contributing to a probability of attaining successful communication. According to an aspect of the present invention, this may be achieved by separately displaying the RSSI and an interference level of a received signal.

Referring to Fig. 4 the functions of the mobile radio telephone may be controlled by a microprocessor 100. The microprocessor indicates on display 106 the RSSI of a received signal supplied from a received signal level detector 110. According to an aspect of the present invention, the microprocessor also, or alternatively, indicates on the display 106 the received signal interference level of the received signal supplied from an interference level detector 114. A memory device 102 includes a ROM for storing the control program and other essential information and a RAM for storing temporary data generated during the operation of the microprocessor 100. A key input part 104 consisting of a plurality of keys serves to generate key data to be applied to the microprocessor 100.

The RSSI and/or interference level of a received signal are each displayed on a display 106 under the control of the microprocessor 100, for example, as shown in Fig. 5.

Graphic bars A, representing the RSSI, are referred to as RSSI graphic bars, and graphic bars B, representing the received signal interference level are referred to as interference level graphic bars. By analogy with the graphic bars of Figs. 1-3, described above, a small bar displayed alone represents a weak RSSI or, a high interference level, the small and medium bars displayed together represent a medium RSSI or interference level, and all three bars displayed together represent a strong RSSI or a low interference level.

Overall, each set of graphic bars may preferably be arranged to show a small bar to indicate a low probability of attaining successful communication; a small bar and a medium bar to indicate a medium probability of attaining successful communications; and all three bars to indicate a high probability of attaining successful communication.

A radio part 108 converts a baseband signal received through a modem 112 into a radio frequency signal to be transmitted through a radio channel to a base station.

Alternatively, a radio frequency signal received through antenna ANT is converted into a baseband signal which is then transferred to the modem 112.

The radio part 108 includes the received signal level detector 110 for detecting the RSSI of a received signal, and supplying the detected RSSI to the microprocessor 100.

The modem 112 converts a microphone sound signal from a sound signal processor 116 into a radio frequency signal to be supplied to the radio part 108, or converts a radio frequency signal from the radio part 108 into a baseband signal to be supplied to sound signal processor 116 for supply to a speaker SPK.

In particular, the modem 112 includes the interference level detector 114, which detects a data error rate of the radio frequency signal from the radio part 108, to generate the received signal interference level, which it supplies to the microprocessor 100.

The sound signal processor 116 is connected with a speaker SPK and microphone MIC to transfer the sound signal from MIC to the modem 112 or the signal from the modem 112 to SPK.

The process of displaying the RSSI and interference level of a received signal will now be more specifically described, with reference to Fig. 6.

Microprocessor 100 determines in step 200 whether the received signal level detector 110 supplies the RSSI of a received signal. If the microprocessor 100 receives the information concerning the RSSI, it goes to step 202 to display the RSSI graphic bars, or otherwise to step 204.

In step 202, the small RSSI graphic bar is displayed alone on the display 106 if the RSSI is weak, the small and medium RSSI bars are displayed together if the RSSI is medium, and all the three RSSI bars are displayed if RSSI is strong.

Subsequently, in step 204, the microprocessor determines whether the interference level detector 114 supplies the interference level of the received signal. If the microprocessor 100 receives information concerning the interference level, it goes to step 206 to display the interference level graphic bars.

Similarly to the process of step 202 the small interference level graphic bar is displayed alone on the display 106 if the interference level is high, to signify a reduced probability of successful communication. The small and medium interference level bars are displayed together if the interference level is medium, to signify a medium probability of successful communication. All three interference bars are displayed if the interference level is low, to signify a high probability of successful communication.

Thereafter, the process returns to step 200.

Thus, the invention provides a device and method for displaying a level of interference in mobile radio communications, on a portable mobile radio terminal. The invention also provides a mobile radio telephone which enables a user to be correctly informed of the probability of attaining successful communication together with the causes contributing to the probability.

While the present invention has been described with reference to certain specific embodiments, by way of illustrative examples, it will be appreciated by those skilled in the art that various changes and modifications may be made without departing the scope of the present invention. In particular, the device and method of the present invention may be adapted to provide for the display of parameters other than RSSI and/or interference level. Two or more parameters may be displayed:

Alternatively, only one parameter, such as interference level, may be displayed.

<

The parameters may be displayed concurrently, on adjacent bar graphs. The parameters may alternatively be displayed one at a time, in turn, on a single bar graph.

The bar graph (s) may have more, or fewer, than three bars, and be controlled appropriately, by analogy with the three-bar bar graphs described.

Display devices other than bar graphs may be used: a numerical representation may be used, a single line

of varying length, or a symbol of varying dimension or intensity. In particular, a variable indication method may be used for displaying the probabilities of attaining successful communication, using a digit, or an icon, or a graph or similar means. Display means other than LCD may be used. For example, each bar graph may be replaced by a tri-colour LED, each colour representing one of the three states shown in Figs. 1-3.

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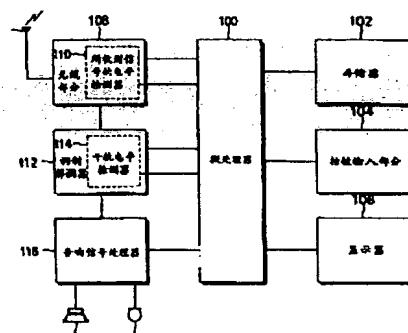
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权利要求书 1 页 说明书 3 页 附图页数 4 页

[54] 发明名称 移动无线终端中成功通信概率显示装置及其有关方法

[57] 摘要

一种显示移动无线电电话机获得成功通信的概率的方法,包括下列步骤:检测所收到信号的所收到信号强度标志(RSSI);检测所收到信号的数据误差率,从而产生所述收到信号的干扰电平;显示有关 RSSI 和所收到信号干扰电平的信息。



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权 利 要 求 书

1. 一种显示移动无线电话机获得成功通信概率的装置，其特征在于，它包括：

5 一个接收信号电平检测器，用于检测所收到信号的所收到信号强度标志(RSSI)；

一个干扰电平检测器，用于检测所述收到的信号的数据误差率从而产生所收到信号的干扰电平；

10 一个显示器，用于显示有关所述 RSSI 和所收到信号干扰电平的信号；和

一个微处理器，用于处理所述 RSSI 和所收到信号的干扰电平，从而产生所述信息。

2. 一种显示移动无线电话获得成功通信的概率的方法，其特征在于，它包括下列步骤：

15 检测所收到信号的所收到信号强度标志(RSSI)；

检测所述收到信号的数据误差率从而产生所收到信号的干扰电平；和

显示有关所述 RSSI 和所收到信号干扰电平的信息。

说 明 书

移动无线终端中成功通信概率显示装置及其有关方法

5 本发明涉及移动无线电终端。更具体地说，涉及一种成功通信概率显示装置，供显示象 CDMA(码分多址)移动无线电电话机之类的移动无线电终端获得成功通信的概率。

10 通常，移动无线电终端通过不断检测收自基地台信号的所收到信号强度标志(RSSI)显示达到成功通信的概率。举例说，这类概率在移动无线电终端的 LCD(液晶显示器)上以三种条形框图显示出来，如图 1 至 3 中所示。若检测出的 RSSI 强，表明成功通信的概率最高，15 则分别为小、中、大的所有三个框条就顺次显示出来，如图 3 中所示。同样，若检测出的 RSSI 分别为中等或微弱，则分别表明概率较小或最小，就如图 2 中所示那样显示出小框条和中等框条，或如图 1 中所示那样只显示出小框条。

20 然而，达到顺利通信的概率并不只与 RSSI 有关。若有来自毗邻信道或基地台的无线电波干扰，则 RSSI 再强，概率也还是会下降的。因此，有人建议，显示概率时考虑到所收到信号的数据误差率。例如，若检测出 RSSI 强但误差率高，则显示出低的概率。但这样就不能正确告诉用户造成达到顺利通信概率的原因。

本发明的目的是提供一种能正确告诉用户造成达到顺利通信概率的原因的移动无线电终端顺利通信概率显示装置。

25 按照本发明的一个方面，本发明显示移动无线电电话机达到顺利通信概率的方法包括下列步骤：检测所收到信号的 RSSI；检测所收到信号的数据误差率从而产生所收到信号的干扰电平；显示有关 RSSI 和所收到信号干扰电平的信息。

现在参看仅为举例说明的附图更具体地说明本发明。

图 1 至图 3 是现有技术在一般的移动无线电终端的 LCD 上显示

出的框条的示意图，这些框条表示达到顺利通信的概率。

图 4 是本发明移动无线电电话机的方框图。

图 5 是本发明移动无线电电话机的 LCD 上显示出的框条的示意图。

5 图 6 是本发明显示移动无线电电话机获得成功通信概率的过程流程图。

本发明给移动无线电电话机配备一种通过分别显示所收到信号的 RSSI 和干扰电平，使用户可以正确知道造成获得成功通信概率的原因的装置。

10 参看图 4，移动无线电电话机的整个功能由微处理器 100 控制。

微处理器 100 还在显示器 106 上显示收自信号电平检测器 110 的信号的 RSSI 和收自干扰电平检测器 114 的信号的干扰电平。存储器 102 有一个 ROM(只读存储器)和一个 RAM(随机存取存储器)，ROM 供存储控制程序和其它主要信息，RAM 供存储微处理器 100 工作过程中产生的临时数据。由多个按键组成的按键输入部分 104 用以产生按键数据加到微处理器 100 上。

20 所收到信号的 RSSI 和干扰电平在微处理器 100 的控制下显示在显示器 106 上。以下称显示 RSSI 的框条图为 RSSI 框条图，显示所收到信号的干扰电平的框条图为干扰电平框条图。参看图 5，RSSI 框条图以符号 A 表示，干扰电平框条图以符号 B 表示。上面说过，小框条单独显示出微弱的 RSSI 或干扰电平，小框条和中等框条在一起显示中等 RSSI 或干扰电平，三个框条一起，显示强 RSSI 或干扰电平。

25 无线电部分 108 将通过调制解调器 112 收到的基带信号变成射频信号，通过无线电信道传送给基地台，或将通过天线 ANT 收到的射频信号变成基带信号传送给调制解调器 112。无线电部分 108 有一个接收信号电平检测器 110，检测所收到加到微处理器 100 的信号的 RSSI。调制解调器 112 将音响信号处理器 116 来的音响信号变

换成射频信号提供给无线电部分 108，或将无线电部分 108 来的射频信号变换成基带信号提供给音响信号处理器 116。特别是，调制解调器 112 有一个干扰电平检测器 114 检测无线电部分 108 来的射频信号的数据误差率从而产生所收到信号的干扰电平。音响信号处理器 116 与扬声器 SPK 及话筒 MIC 连接，将来自 MIC 的音响信号传送给调制解调器 112 或将来自调制解调器 112 的信号传给 SPK。

现在参看图 6 更具体地说明所收到信号的 RSSI 和干扰电平的显示过程。微处理器 100 在步骤 200 确定所收到信号电平检测器 110 是否提供所收到信号的 RSSI。微处理器 100 若收到有关 RSSI 的信息，就转入步骤 202 显示 RSSI 框条图，否则转入步骤 204。在步骤 202，若 RSSI 微弱，显示器 106 上就只显示小框条图，若 RSSI 中等，就一起显示小框条和中等框条，若 RSSI 强劲，就显示所有三个框条。接着，在步骤 204，微处理器再次确定干扰电平检测器 114 是否提供所收到信号的干扰电平。微处理器 100 若收到有关干扰电平的信息就转入步骤 206 显示干扰电平框条图。同样，若干扰电平弱，显示器 106 上就只显示小框条图，若干扰电平中等，就小框条和中等框条一起显示，若干扰电强，就显示所有三个框条。这之后，程序返回步骤 200。因此，本发明提供了一种能正确告诉用户获得成功通信概率及造成该概率原因的移动无线电电话机。

上面已结合附图就本发明的一些具体实施例说明本发明，而本技术领域的行象们都知道，在不脱离本发明精神实质的前提下是可以对上述实施例进行种种更改和修改的。

说 明 书 附 图

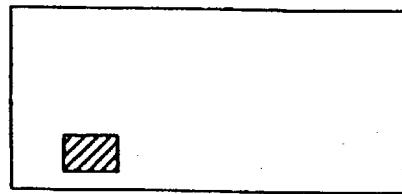


图 1

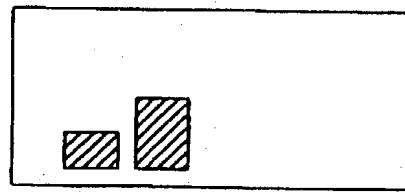


图 2

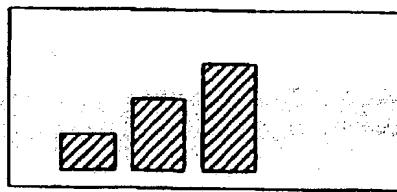


图 3

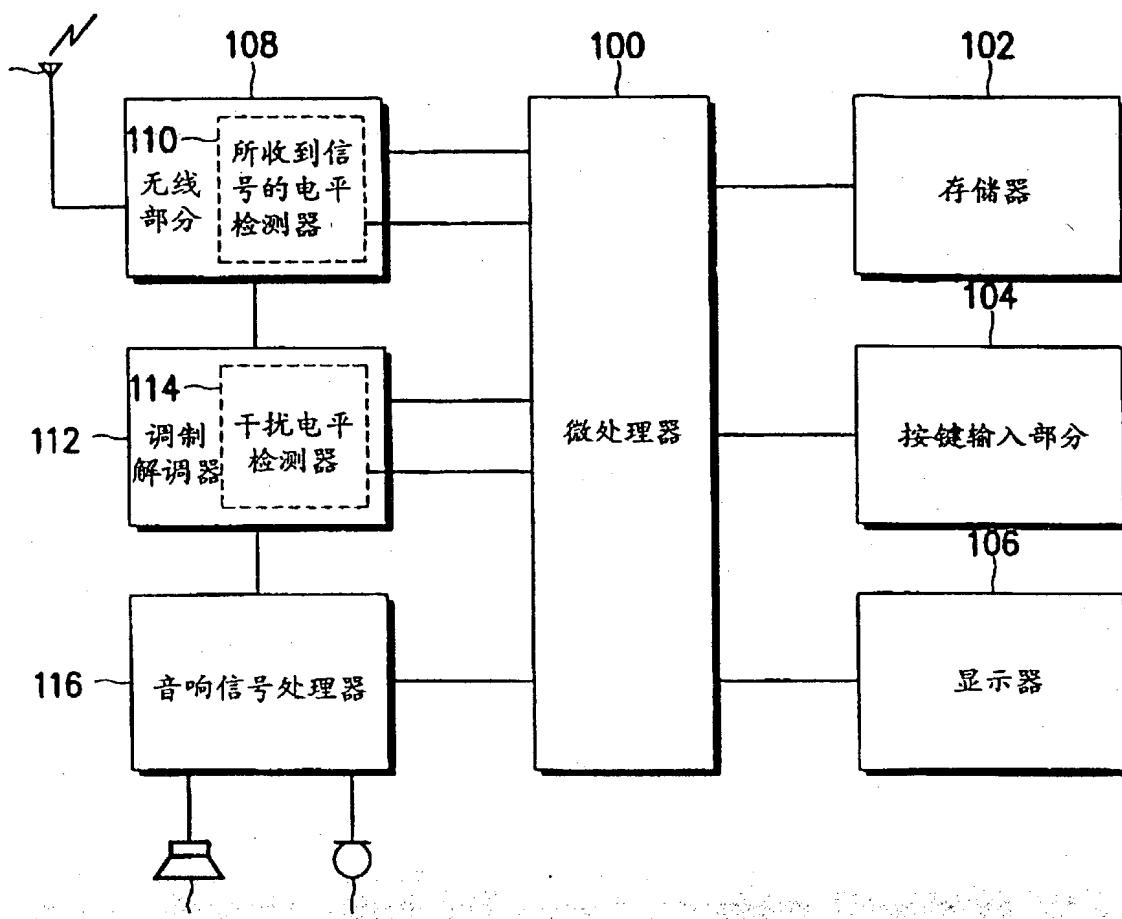


图 4

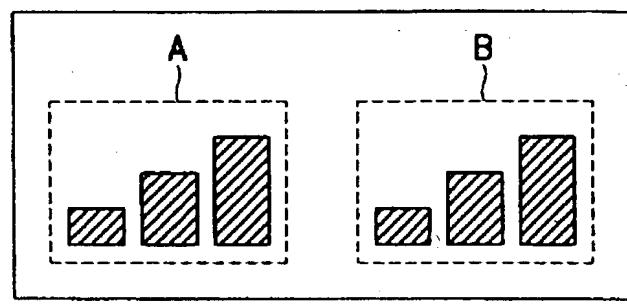


图 5

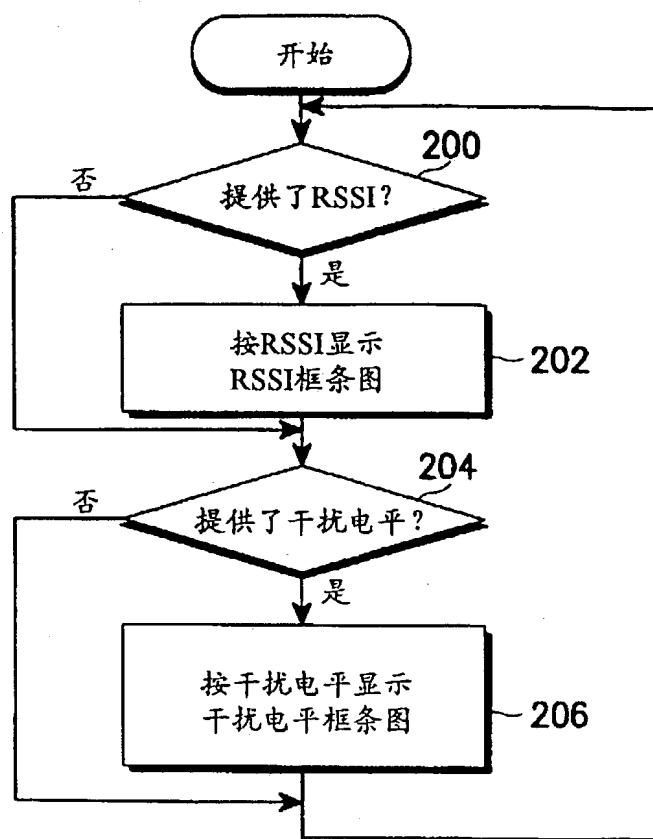


图 6